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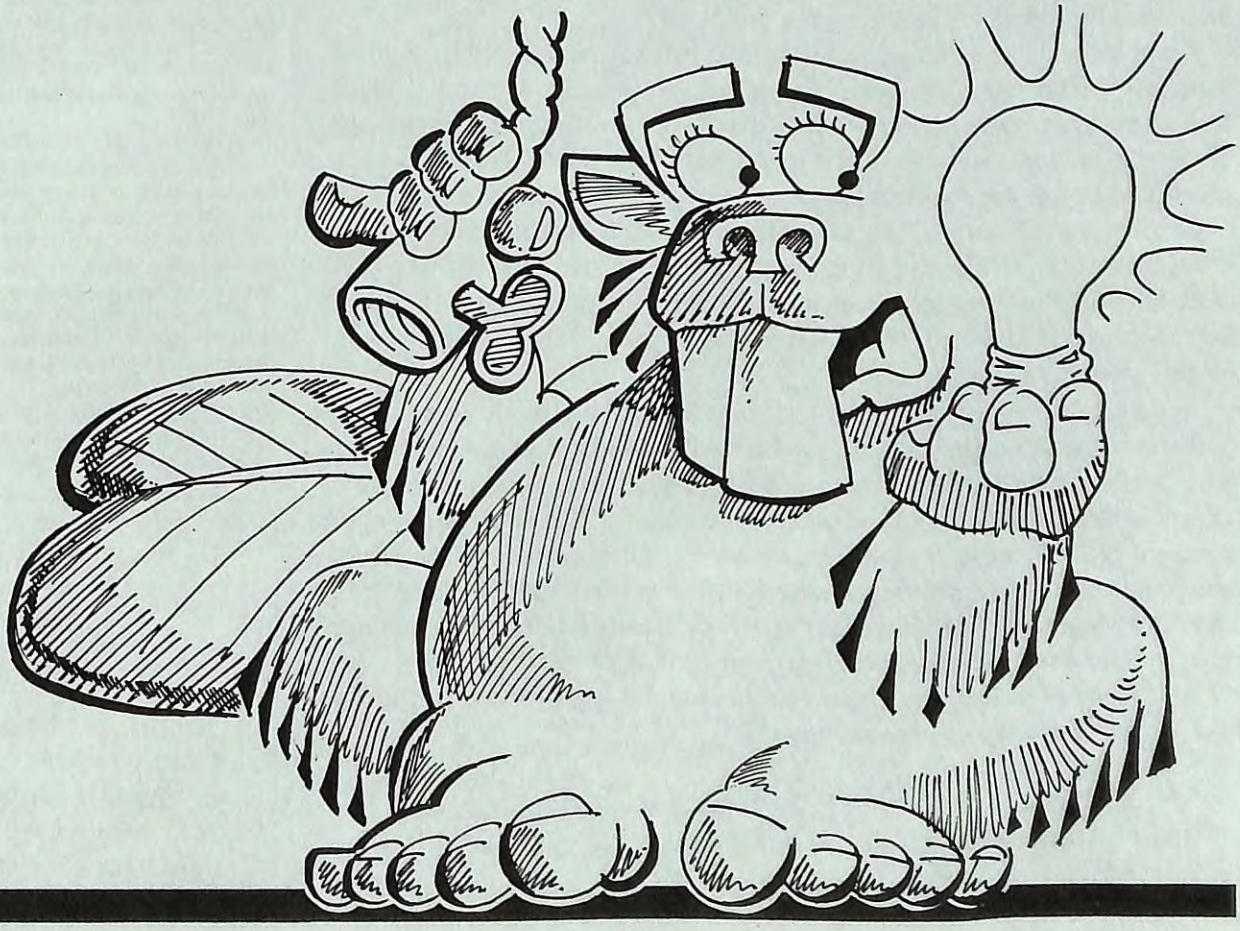
Lighting Efficiency



From the Editor . . .

We are becoming sensitized to the concerns for the environment, both global, local and indoor. We've reached a point in human evolution that because of our numbers are having tremendous impacts on the world.

If we don't start to take action quickly, the consequences may be so severe as to be beyond repair. Fortunately, we are learning that all is not doom and gloom. If we do some homework, keep an open mind and change the ways we work and play, there is hope for the planet.

At the same time, we must try to put everything in perspective and not get carried away. This came home to me recently at a presentation by a representative of a European natural paints company (all product made from naturally occurring, mostly organic raw materials). Our concern for toxic emissions from various products used indoors has led to a greater demand for low emissions materials as we start to pay attention to product selection. Low emissions materials, have gained a high profile, and paints and finishes that have low or no volatile organic compounds (VOC) emissions are being put on the market. To encourage this shift, the R-2000 Program has listed them on the materials pick-list. All this is being done in the name of being environmentally sensitive and improving the indoor air quality of our buildings.

However, and this is ironic, some products made from completely "natural" materials will not qualify because of their high VOC levels. After all, the fresh fruit aroma of an apple, orange or lemon is a VOC, as is the smell of fresh wood. The highly aromatic cedar smell in fact is a very toxic VOC (that is why cedar chests and closets are so effective).

So what are we to use? Does that mean we can't use natural materials?

Of course not. It's simply that we must be selective in our choices. The VOC emissions are a real concern for some individuals - especially those that have become sensitive to various chemicals. For those individuals, even natural non-treated products are a problem.

At the same time, chemicals and aromas generated by nature are a part of the global environment. But when we synthesize them and create new products in ever increasing quantities where they didn't exist before, usually from petro-chemical feedstocks, we could be asking for problems. That is why many of the synthetic products we have created are a cause for concern. Many of the concerns and problems arise from the manufacturing process that creates the products as much as the product themselves. In the case of natural products, the manufacturing process is much more benign in many (but not all) cases.

As with all other things in life, we must be careful with product selections so that we don't overtax the environment.

Richard Kadulski
Editor

solplan review

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R-2000 design evaluations
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Efficient Lighting

Lighting is one of those elements in the home that usually gets little thought. Lighting is installed because we need it, but usually without much thought, other than the selection of fixtures as decorative elements for themselves, rather than how they perform.

There's a tendency to think that if there's lots of windows, we'll have lots of light. But no matter how many windows, or where they're placed, they contribute no light after the sun has set. In northern climates, it means very long dark winter nights.

Why be concerned about lighting energy efficiency? Lighting represents a significant amount of the total electrical usage. Besides energy economic concerns, there are intangibles that should be considered, including: lighting quality; durability; availability; safety; maintenance; appearance.

The tendency has been to consider that more light is better. In part, this attitude has been fostered by the standards established by the IES (Illuminating Engineering Society), the major standards setting body. This organization is dominated by product manufacturers keen to see product sales, so there is a bias to use more product. This is especially noticeable in some shopping centres - where it's so bright you have to put on sunglasses when you go inside!

More light doesn't make a space better lit or safer. It's how the light is distributed that's important. Lighting levels with variable intensities create more interesting spaces and can be much more effective with lower overall energy use.

Three lighting design principles:
Accent lighting
Task lighting
Ambient lighting

Accent Lighting can be used to create drama, by spot lighting decorative elements such as art, sculptures or a flower arrangement, and to reveal architectural elements. Accent light adds drama and interest. Theatre designers have known this for a long time as light is often used to create an environment on an otherwise bare stage. Recessed adjustable accents fixtures and track lighting can be used for accents.

Task Lighting illuminates specific visual tasks. It is used to provide lighting to aid visual work and minimize eye strain. Light levels should vary, depending on the task. Sewing, drafting or work on miniatures requires much higher light levels than sitting at a desk writing cheques or working on a computer.

Task lighting fixtures should be placed near the area where the tasks are performed. The light source must be located carefully not to create unwanted glare or shadows. Fixtures can be table or desk lamps, floor lamps, under-cabinet lights, low voltage strip lights, dropped pendants.

Ambient Lighting provides general lighting to create background lighting for visual comfort and personal safety. There are many ways to provide this.

Downlighting can be used to fill in an indirect lighting scheme; recessed wall washers, coves, valances, cornices and soffits to wash light over surfaces; recessed downlights; track lighting; and downlight pendants.

Wall and ceiling colours that are light can reduce the tunnel effect and visually increase height of room.

The efficiency of lamp sources is of interest to the energy gurus, but the home owner is more interested in the quality of light to do the job, be it mood lighting, accenting a work of art, or light for grooming. To assess light quality, there are two reference terms used: colour temperature and colour index.

Colour Temperature

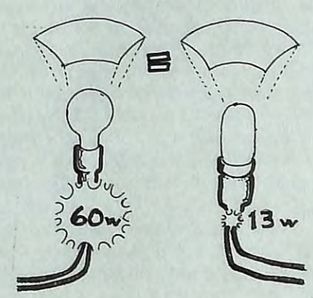
Colour temperature describes the colour appearance of the light. It is measured in Kelvin units (K), ranging from 9000K to 1500K. The higher the Kelvin temperature the colder (bluer) the colour of the light appears. The lower the Kelvin number, the warmer (or yellower) the light. Light sources of 2000 to 3000 K are considered to have a warm tone and 4000 to 6400K are considered cool.

Colour Rendering Index

Colour rendering index (CRI): is a reference number that relates the way we see colours of objects when lit by a particular lamp, compared with its colour when illuminated by a reference source of comparable colour temperature. The CRI scale ranges from 0 to 100 with incandescent and tungsten halogen lamps as benchmarks.

Light Sources

The light output of a lamp is not measured by the wattage, even though that has been the way lamps are sold, but rather by the light output. The unit of light output is measured in *lumens*. Table 1 lists the light output of common lamps.



Incandescent lamps are the original type of lamp and still the most common ones used. They are also very inefficient - generating more heat than light.

Fluorescent

Compact fluorescent lamps come in a vareity of sizes and shapes, and weight from the standard incandescent. The typical lamp consists of one or two narrow tubes bent into a U-shape or connected by a bridge. This altered shape may make them unsuitable for use in some existing light fixtures.

They also require a ballast. Two types of ballasts are made for compact fluorescent lamps: electromagnetic and electronic. The heavier electromagnetic ballast is slow to start, can flicker when starting and cannot be dimmed. New electronic ballasts are coming on the market. These allow the lamps to perform like incandescent by providing light instantly when turned on. Electronic ballasts are lightweight, more efficient and some can be dimmed, but electronic ballasts are usually more costly.

Compact fluorescent lamps are about four times more efficient than standard incandescent bulbs and last about ten times longer. They are available in warm to cool-white colours and have high colour-rendering qualities.

Tungsten-halogen

A tungsten-halogen lamp is an incandescent lamp with halogen gases sealed into the lamp. They operate at a high temperature and a high internal gas pressure. If not handled according to the manufacturer's instructions, a lamp could shatter. Certain lamps may also emit some ultraviolet radiation which is why a protective shield, a screen or both must be used with the luminaire to protect people and surroundings from both hazards. The luminaries are small and lightweight with precise control of the light. Their colour is excellent, giving a whiter light than a conventional incandescent with a continuous spectrum that renders all colours well.

Halogen lamps have no ballast, are easy to install, and require no warm-up or waiting after a momentary power interruption. They can be dimmed, but should be operated at the highest level periodically. They can be used outdoors.

Table 1

Light output of various lamps

Lamp	watts	lumens	lumens watt	lamp life (hrs)
Incandescent				
R-lamp	75	460	6	2,000
	100	900	9	2,000
A-lamp	40	480	12	2,500
	60	860	14	1,000
	75	1,200	16	1,000
	100	1,720	17	750
	150	2,850	19	750
Halogen	52	770	15	3,500
	75	1,300	17	2,250
	100	1,880	19	2,250
Compact	9	600	50	10,000
fluorescent	13	825	52	10,000
	26	1,800	60	10,000
	39	3,150	73	10,000
large	20	1,250	50	18,000
fluorescent	40	3,150	73	20,000
	32	2,900	93	20,000

Controls

The standard is the basic on-off switch. However, there are areas where we want moods created by varying the lighting levels. Dimmers give the user flexibility and control over light and can also extend lamp life. Dimming an incandescent lamp by 25% can extend its life four-fold. Dimming reduces wattage consumption but a much greater reduction of light output.

But if you are going to install dimmers, be aware that inexpensive models will create "noise" in circuits and affect radio reception. The $4.99 dimmer at the discount store is the one to stay away from. Better quality "specification grade" dimmers will reduce potential problems although the price difference is not much. Typically they will cost 10.00 - $ 20.00.

Other Control Strategies include Automatic On/Off Controls and Motion Sensors.

"Active" sensors send out microwave or ultrasonic signals; "Passive" sensors use infrared waves. Their most common usage is for exterior lighting.

Photocells can be used to turn lights on at dusk and off at dawn. They typically fit between the lampholder and lamp but they don't work well with ALL fluorescent fixtures.

Recessed downlights

Recessed downlights require one 75-watt or 150-watt lamp for every 30 to 40 sq. ft. of floor area. Compact fluorescent can be used instead and require one or two 13-watt compact lamps. To obtain a higher light output, however, a specular clear alzack reflector should be used. One with a black baffle will deliver 25% less light.

Adaptor kits for existing recessed downlights can convert incandescent downlights to one or two compact fluorescent lamps.

Lighting design tips

Good lighting doesn't just happen; it requires planning. Lighting should be looked at room by room. A one size fits all approach is not going to give a satisfactory lighting scheme.

When selecting lighting for a home, it is important to consider a few other points. Most important is the finishes in the room, as the colours and materials will have a major impact on the type of light and light levels achievable. The fundamental principle is that light colours reflect light - dark colours absorb light. Rooms finished in light colours will increase the efficiency of the light system.

Kitchen

It's become fashionable to use recessed pot lights in kitchens - unfortunately too often they only provide ambient background lighting, but not adequate lights for tasks, unless there's an excessive number of lamps installed, yet fluorescent lighting provides good general lighting.

The kitchen is the workshop of the home. Activities range from critical seeing tasks - such as reading small print and handcutting small foodstuffs, to atmosphere lighting where a low level of light is sufficient for a late evening snack so lighting requirements are variable.

There should be enough lighting in the kitchen to provide safe movement through the room, allow for casual seeing tasks and for visibility inside cabinets. Under cabinet lights provide good task lighting. Work counters should be light in colour (no darker than the walls) and have a non-glossy finish to prevent mirror-like reflected glare.

Exterior entrance

Fluorescent lighting can be used outside only in mild climates such as the Vancouver - Victoria area. (where design temperatures don't drop below -8 or -9°C). In colder climates incandescent lamps must be used. (Cold temperatures affect the operation of fluorescent lamps, so at below freezing temperatures light levels can drop by 50% or more).

Hallways

Fluorescent lighting is a good approach.

Bathrooms

Vanity lighting, whether in the bathroom or bedroom, requires well placed, quality luminaries to illuminate both sides of the face as well as under the chin. Ideal mirror lighting - evenly distributed light to both side of the face - has no shadows to interfere with a smooth shave or delicate make-up. Unless the bathroom is very large, or an unusual shape, the light for the vanity mirror can supply the lighting needed for the room.

Fluorescent is an excellent choice for bathroom mirror lighting - giving a soft, shadow free diffused light. The fluorescent tubes are especially suitable for long vanity counters that have a large mirror area. Any dropped swag type lamp here would reflect in the mirror and create an uncomfortable glare.

Laundry or Utility Room

Fluorescent lighting is an excellent efficient light source.

Lighting terms

lamp watts: the electrical power input to a lamp

total watts: the electrical power input to a lamp(s) and ballast combination

ballast: a device used with all electric discharge lamps to provide the proper conditions of voltage and current for correct starting and operation. This device has inherent losses, which will add to power consumption of the overall system

lumen output: amount of light available from a lamp

initial lumens: rated lumen output of a lamp when new or

efficacy: a measure of light source efficiency in lumens per watt of power input.

lamp life: number of hours for 50% of an average batch of lamps to burn out. In practice, some lamps will burn out before this time, while others will operate much longer. for fluorescent lamps, this is based on three hours per start.

light loss factor (LLF): a factor used in calculating illuminance after a specific period of time under given conditions.

HOT2000 VERSION 7

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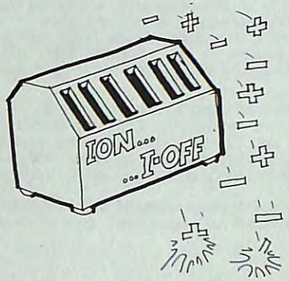
Ionisers: Do they do anything?



Ever since ions were discovered at the end of last century, they have been the subject of lively debate. Claims about biological effects are very controversial, especially as research in the 1960's and 1970's was very questionable, with the concern about sick buildings, the effects of small air ions on people's wellbeing indoors have again attracted interest.

Claims are made that negative ions in the air are good for health. But this is a myth with its roots in the research of the 60s and 70s that has been harshly criticised.

Most buildings today are mechanically ventilated. Many of the sick building symptoms are considered to be due to the effect of ventilation on indoor air. It has been claimed repeatedly that the concentrations of small ions in mechanically ventilated premises are abnormally low and that natural ion concentrations should be created artificially to improve air quality" It has also been said that "in ventilated premises there is often a considerable excess of positive small ions" and that "the ionic balance of air should therefore be restored by artificial ionisation.

When the ventilation system is running there may be more particles and fewer ions in the air stream. The effect of ventilation air flow on the ion contents was affected mainly by to the particle content of the supply air. The variations in ion and particle concentrations were much larger than the variations in the concentrations measured for different systems.

A study at the Royal Institute of Technology, in Sweden, found that it is entirely pointless to use ionisers to "restore a natural ionic balance and ion levels in the ventilated premises". The reason for this in part is that a "natural ionic balance" cannot be defined, and partly that in most cases ionisers create unnatural atmospheric electricity conditions, with ionic concentrations which may be many times higher than natural concentrations.

What about the biological effects of small ions? A review of 800 reports from all over the world found there is no scientific evidence which can prove that ions have unambiguous and reproducible effects on people. There is therefore nothing to suggest that the variations in small ion concentrations which usually occur in an indoor environment can give rise to the complaints which have been reported in sick buildings.

The bottom line is that the benefits of ionisers are myths perpetuated for the benefit the makers and retailers of ionisers.

"On biological effects of small air ions and the use of ionisers in occupied indoor environments" and *"small air ions in mechanically ventilated environments" by Ivo Martinac at Royal Institute of Technology, Stockholm, Sweden.*

Insulation: Total Thermal Resistance Values

We build better insulated houses today spurred on by Building Codes that mandate minimum insulation levels that are much higher than conventional practice of a few years ago.

For convenience most codes rely on nominal insulation values, not the true R-value of the entire building assembly.

Are you getting what you think you are?

Differing insulation products have different properties. Some products labelled with an R-value may in fact have a considerably different value in actual conditions because the R-values are based on a laboratory test at assumed conditions (standard tests are not performed at very low, sub-zero temperatures). Theses ratings are alright for comparison purposes, but the real world has more variation and extremes.

All building materials used in an assembly contribute to the thermal performance. To calculate the actual R-value of a wall, you have to consider not only the insulation, but all other elements, including siding materials, sheathing, framing, exterior finishes, and even the thin layer of air at the surface (both inside and out).

As long as walls had minimal insulation levels, the impact of wood framing or other thermal bridges was not very significant, but with today's higher insulation levels it has a greater impact.

A number of tests that measured overall thermal resistance (steady-state performance) of an element have found that R-values can differ significantly from predicted values if thermal bridges were not accounted for in the calculation. A test of seven generic wall systems done at the National Research Council found that the actual thermal resistance varied from 45% to 90% of "book" (theoretical) value.

All the materials except for the insulation generally have low insulating values, and may not add more than an R 1 or 2 to a wall assembly, but framing can account for 20, 25% or more of the surface area of the wall, so it can have major impacts to overall performance. As the framing members act as thermal bridges they must be averaged into the overall wall values.

Even small thermal bridges in an insulation layer can substantially reduce the average thermal resistance of a component.

Average overall R-values of wood frame walls are calculated by assuming parallel heat flow paths through areas with different thermal resistances. This means you calculate the R-value at the framing and at the insulation and then average it based on the area of each, as a ratio of the total area.

This is done at conditions that assume conditions are at equilibrium or steady-state, not subject to constant fluctuations, disregarding effects of heat storage; assumptions are that surrounding surfaces are at ambient air temperature and the exterior wind velocity is 24km/h.

In the case of materials with high conductivity, such as steel, this approach is not appropriate. Recent findings show that the influence of the metal is greater then just the dimension of the metal stud - in other words the impact of a steel stud is as if it were much larger than it is.

The new version of HOT2000 (version 7) will incorporate a new model that will calculate the true R value of an assembly, rather than just using nominal values.

We've compiled a number of assemblies and their composite R-value. This shows the variation possible, and shows that you shouldn't rely on just nominal R-values. A 2 x 4 wall can give you more insulating value, than 2 x 6.

Wall Insulation values

Framing	Spacing	Insulation	Nominal R-value	Actual R-value	
2x4	16" o/c	*R12 fiberglass*	*12*	10.93	
				11.56	wood siding
2x4	16" o/c	*R14 fiberglass*	*14*	11.78	
				12.44	wood siding
2x4	16" o/c	*R12 fiberglass plus R5 exterior insulation*	*17*	16.41	
2x4	16" o/c	*R12 fiberglass plus R7 exterior insulation*	*19*	18.51	
2x4	16" o/c	*R12 fiberglass plus R8 exterior insulation*	*20*	19.56	
2x4	24" o/c	*R12 fiberglass*	*12*	11.45	
2x4	24" o/c	*R12 fiberglass plus R5 exterior insulation*	*17*	16.68	
2x4 steel studs	16" o/c	*R12 fiberglass*	*12*	6.85	measured test results
2x6	16" o/c	*R20 fiberglass*	*20*	16.22	
				16.88	wood siding
2x6	24" o/c	*R20 fiberglass*	*20*	17.14	
2x6	24" o/c	*R20 fiberglass plus R5 exterior insulation*	*25*	21.98	
Super-lock, Nascor 1		*3.5" EPS*	*12.95*	13.13	assumes 20% total framing
Super-lock, Nascor 1		*3.5" EPS plus R8 batt*	*20*	15.95	
Nascor II		*5.5" EPS*	*22*	20.13	
Insul-wall	2x4 system	*3" EPS*	*11.1*	12.95	
Insul-wall	2x4 system	*3" EPS plus R8 batt in cavity*	*20.6*	17.6	
stressed skin panel	4 5/8" panel	*3 5/8" polyurethane*	*28*	23.06	assumes 10% total framing

The calculated values assume a ½" interior gypsum board finish, cement stucco exterior finish on plywood sheathing (except as noted). Brick veneer has similar properties to stucco.

Other than acrylic stucco applied on an insulating substrate (usually EPS) no siding has an R-value greater than about 1.

Except as noted, all assemblies assume that 25% of the surface area is framing for 16" o/c; 20% for 24" o/c. This accounts for headers, plates, cripples, etc.

1" extruded polystyrene (e.g. DOW SM) or 1 ¼" type II Expanded polystyrene (Beadboard) has an R value = R5

2" rigid fibreglass (e.g. Glasclad) has an R value R8

Why be concerned?

Thermal bridges can contribute to moisture damage by providing cold surfaces in an assembly, affecting the durability of the construction.

With the range of materials available today, you can have a number of options that will best fit the budget and meet the desired intent.

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Duct Cleaning: is it worth it?

Duct cleaning companies do a lot of marketing to promote the beneficial aspects of cleaning heating ducts. Advantages promoted include improvements in ventilation flow rates, reductions in airborne dust in houses, better comfort, and lower energy costs.

Is there any truth to the claims? There is no doubt that cleaning ducts is necessary sometimes but it is not easy to measure the results of duct cleaning.

In the commercial sector, Finnish researchers found that cleaning ducts did not affect ventilation flow rates because of the low concentrations of dust in ducts.

Another study looking at residential systems found that the amount of airborne dust in the houses *increasedd* less than two days after the cleaning. Tests for micro-organisms indicated a reduction in airborne concentrations after the cleaning but these reductions were so small they could also have been caused by lower levels of micro-organisms outside.

A study for CMHC was done in the Montreal area to look at the effects of duct cleaning on the air quality in houses. This project was small and does not provide a comprehensive evaluation of all duct cleaning methods, but it does provide some interesting insights.

Many duct cleaners finish their task by spraying biocides into the newly cleaned ducts, thus introducing questionable contaminants into the house. The study did not test for these biocides.

There were an average of two people in each house and each had, on average one pet, (mostly dogs or cats).

Four duct cleaning techniques are typically used.

Industrial vaccums

Cleaning with an industrial vacuum and brushes is the most common method. This consists in brushing all the ducts, one by one. Debris and dust is pushed to the end of the ducts to cleanouts where they are removed with a vacuum. Some vacuum cleaners have high efficiency particle (HEPA) filters.

Because competition is stiff, it's difficult to find out on the phone what type of vacuum the cleaning company actually uses.

Cleaning with Industrial Vacuum and Air Spray

This is similar to the industrial vacuum and brushes but uses an air compressor to increase the pressure in the ducts. The jet of air in the ducts pushes the dust toward the vacuum cleaner.

Vacuum Truck

The vacuum truck method is employed mainly by the larger cleaning companies. A high power vacuum cleaner and an air compressor are mounted in a truck and attached to the fan casing with a 12" (30cm) diameter ducts extending to the outside. Most companies also have cleaning brushes but do not use them in the cleaning operation.

Vacuum Truck and Metal Ball

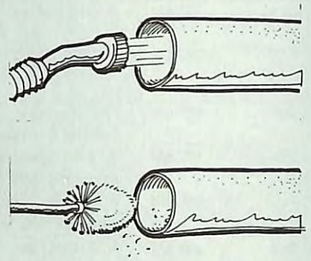
Another method uses a selection of metal balls attached to the end of the air compressor line. This system uses metal balls to stir up the air which is sucked in by the vacuum in the truck.

The Test

Dust was measured on the duct surface, in the air leaving the ducts, and in the house air. The results did not indicate any major differences between the cleaning techniques. Cleaning did not have a significant effect on house airborne dust concentrations. The largest reductions in dust occurred in the return air vents where the initial concentrations were the highest. The dirtier the ducts to begin with the more effective the cleaning.

Ventilation flow rates for the supply air ducts were done before and after the cleaning. The difference was insignificant.

Flow rates in the return air ducts increased 2 L/s after cleaning, not a significant amount.



Cleaning the ducts did not reduce energy consumption and may even have increased it.

The results indicate that a cleaning technique which concentrates on the return air ducts and the fan may be the most efficient solution.

It would be more profitable for the owners to have the ventilation dampers and registers adjusted than to have the system cleaned if they wanted to improve the air distribution.

In many cases, after cleaning the surface did not appear to have been affected by the cleaning. Some ducts were not even touched by the cleaning. We know from other studies that residential ducting systems are very leaky, so it is not surprising that here is little overall effect.

It's evident that duct cleaners are great sales people. Does this mean it's a scam? Not at all, but perhaps it's not that important a maintenance function in most houses.

Homeowner Comments?

On the whole, the homeowners did not have a firm opinion about the efficiency of the cleaning process. Many did not feel that they were in a position to judge whether or not the work was acceptable.

"Efficiency of Residential Duct Cleaning" by Auger, Donnini & Nguyen Inc., Montreal, Quebec
Prepared for: The Research Division
Canada Mortgage and Housing Corporation Ottawa, ON K1A 0P7

"Combo" Space and Domestic Hot Water Heating Systems

The last several years have seen a rapid growth in the installation of combination space-heating/domestic water-heating systems that use conventional residential gas-fired, storage-type water heaters as the sole source of heat.

A combo system supplies hot water to both forced air space heating and domestic hot water heating. The system may be a single unit, modular unit, or separate components assembled together.

B.C. has seen an explosion of interest in this type of system. One reason is that for better insulated houses with low heat loads a combo system provides the opportunity of efficiently and economically providing heating systems without excessive oversizing.

Until now this type of system has generally relied on the expertise of the system designer and installer, as it has involved the assembly of a variety of components. Manufacturers are starting to market packaged combo units.

Part 9 of the National Building Code requires residential buildings maintain an indoor temperature of 22°C and that an adequate supply of service hot water be provided. If the combo system meets the requirements of the Building Code, for both space and service water heating, it should be acceptable under the Code.

But some building authorities have had difficulty accepting something different. (Solplan Review No. 45) To deal with the concerns of building officials, a government-industry committee developed guidelines for such systems.

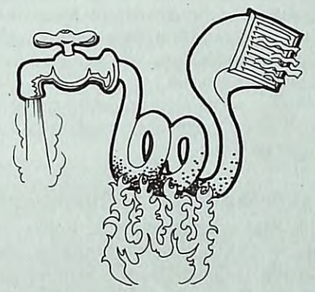
Key features of the guidelines are:

All combo systems must use piping and components approved for use with potable water.

The water heating appliance and fan coil unit must be certified by an approved agency, and labelled for dual purpose (space and domestic hot water). Non potable chemicals are prohibited.

Combo systems can't be connected to any components previously used for non-potable water heating systems.

A pump cycle timer must be installed to circulate all water contained in the fan



coil space heating piping and components at least once every 24 hours.

Hot water tanks must be set at a minimum temperature of 140°F. If the system operates at higher temperatures, a mixing valve must be installed so that domestic hot water temperatures don't exceed 140°F.

The velocity of water passing through the system must not exceed 4 feet per second. The total length of supply and return piping from the water heating appliance to the fan coil can't exceed 50 feet.

The capacity of the appliance used as the common source of heat for both forced air space heating and domestic hot water heating shall be the combined total of the space heating load and domestic hot water load. However, ASHRAE and Industry recommends minimum water heater output to be a least 1.4 times by the space heat loss of the dwelling, and this is also acceptable. The space heating portion of the combo system may be designed and installed similar to the normally accepted space heating systems. Heat losses calculated using standard engineering practices (e.g. HRAI design guidelines, ASHRAE standards, HOT2000, etc)

How big a waterheater is needed?

There is not much documented information on total household water needs. The U.S. FHA lists minimum water heater capacity requirements and these are listed in the ASHRAE Handbook of fundamentals, and can be used as a yardstick. We list these in the table.

For a copy of the guidelines, or for more information, Kal Minhas, BC Gas
Tel : (604) 443-6892
Fax: (604) 443-6770

		Gas		Electricity		Oil	
	No. Bedrooms	Tank size	Input energy	Tank size	Input energy	Tank size	Input energy
1 1-1/2 baths	2	30 US gal (114 l)	36,000 BTU	30 US gal (114 l)	3.5 kW	30 US gal (114 l)	70,000 BTU
	3	30 US gal (114 l)	36,000 BTU	40 US gal (150 l)	4.5 kW	30 US gal (114 l)	70,000 BTU
2 2 1/2 baths	3	40 US gal (150 l)	36,000 BTU	50 US gal (190 l)	5.5 kW	30 US gal (114 l)	70,000 BTU
	4	40 US gal (150 l)	36,000 BTU	50 US gal (190 l)	5.5 kW	30 US gal (114 l)	70,000 BTU
	5	50 US gal (190 l)	47,000 BTU	66 US gal (250 l)	5.5 kW	30 US gal (114 l)	70,000 BTU
3 3 1/2 baths	3	40 US gal	38,000 BTU	50 US gal (190 l)	5.5 kW	30 US gal (114 l)	70,000 BTU
	4	50 US gal (190 l)	47,000 BTU	66 US gal (250 l)	5.5 kW	30 US gal (114 l)	70,000 BTU
	5	50 US gal (190 l)	47,000 BTU	66 US gal (250 l)	5.5 kW	30 US gal (114 l)	70,000 BTU

Technical Research Committee News

Canadian
Home Builders'
Association

Demonstration Home Projects:

The Envirohome Initiative

Construction of the **Edmonton Envirohome** is complete, with the official opening September 20. Few roadblocks were encountered, except that there were some problems sourcing some new products, and there is a higher incremental cost to some new products.

The **Saint John, NB Envirohome** is opening September 28.

Each Envirohome meets current R-2000 technical requirements plus all environmental features in the pick list, and is a public demonstration of energy efficiency and environmentally friendly construction.

Reno Demo Project

The Red Deer Reno-Demo project official opening is set for October 7, 1994.

HOT 2000 version 7

You may have heard that a new version is in the works. We can now report that version 7 will be ready at the end of September, 1994. The price for the new version will be $295.00 (The update price for registered users of version 6. will be $70.)

Use of HOT 2000 version 7 will be mandatory in the R-2000 Program effective January 1995.

Polybutylene water piping

It's easy to use, but it may have problems. Concern has been expressed about the durability of polybutylene water piping. It seems that high levels of chlorine can lead to premature failure of the piping. Its use has been banned in some areas in the USA and 1700 home owners in the Washington DC area are involved in a class action lawsuit.

It seems that levels chlorine concentrations over 2 ppm are enough to lead to longer term failure.

Basement Research Project

A joint venture research project involving CHBA, Canada Mortgage and Housing Corporation, the Institute for Research in Construction and the Society of Plastic Industries are in the development stages of a project to establish performance guidelines for basement construction. Issues that will be considered include indoor environment, soils and drainage, heat loss, moisture control, soil gas penetration.

Anyone who wants to participate in the project, should contact CHBA National Office.

Plastic Vent Update

We've reported about the problems associated with plastic venting of combustion appliances. Saskatchewan has banned all such piping, and ULC has withdrawn their listing on all products involved (Plexvent, Ultravent, Selvent).

ULC is testing a foil tape to seal the joints as a temporary fix until a more lasting solution is found. Otherwise, if there is failure in the pipe, it could mean the need to replace the furnace if a B-vent or alternate venting strategy is not feasible.

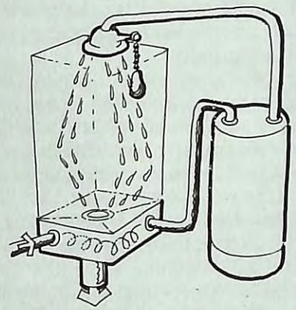
The Technical Research Committee (TRC) is the industry's forum for the exchange of information on research and development in the housing sector. Membership includes builder members and representatives from industry, standards and governments bodies with a n interest in housing. Anyone with a problem, technical question of suggestions for areas that need to be investigated is encouraged to contact their local Home Builder's Association technical committee or the TRC directly.

To contact the TRC:
Canadian Home Builders Association, Suite 200, 150 Laurier Ave. West, Ottawa, Ont. K1P 5J4
Tel: (613) 230-3060
FAX: (613) 232-8214

Heat Recovery Shower

How much water is used when showering? How much energy does a shower use? These are questions that utilities often are asked. If you think of it, it's not much different than asking how long is a string?

Our current trend to use a shower more than the bathtub means more water is used in the shower. While a short shower will use less water than a bath, it all depends on the length of the shower. Anyone with teenagers at home will know



that a single shower can drain a full hot water tank. The fastest shower may last about 5 minutes but the average is probably 10 to 12 minutes. However, there is little research regarding domestic hot water usage (especially by fixture) and what is available not very specific.

Based on a utility survey, the Innovation Centre in Waterloo has estimated that about 50 to 60% of domestic hot water use is for bathing and showering. The standard shower is considered to be the largest user of hot water, using 4 times more water than the second largest (the dishwasher).

There has been a movement to save energy by reducing the water flow rate at the shower head usually by adding a low flow shower head at about 2¼ to 2½ gallons per minute. Showers are the only appliances not under attack to reduce water temperature in order to save energy for obvious comfort reasons.. (It would be hard to convince people to shower with colder water!)

All this heated water flowing down the drain represents an energy waste. Grey water heat recovery has been considered for a long time. A couple of the Advanced Houses tried to incorporate it, but there are many complications when you combine all drain water.

To deal with the energy loss from shower use, a Newfoundland company has developed a heat recovery shower that (they claim) recovers 75% of the energy in the warm water going down the drain. This rather ingenious device has a heat exchanger in the base of the shower stall to recapture heat from the drain water. Obviously, the energy savings are based on the amount of showering that is done. The larger the family and the more teenagers, the greater the energy savings.

R-2000 Program Energy Credit

The R-2000 has accepted this unit, and will give a credit towards the energy budget. For electrically heated houses the credit is 532 kwh/ year and for gas heated houses it will be 821 kwh/year.

The Heat Recovery Shower is a corner unit, with heat exchanger in the acrylic base, and side walls, glass door and a computerized valve assembly. Installation is as easy as a regular shower, except that there has to be a return line to the hot water tank from the heat exchanger.

The computerized motorized valve assembly is a selling feature unto itself, and the company estimates it provides a feature that they could sell without the heat exchanger core.

The Suggested Retail for the entire unit (door, walls, control and base) is $ 2500.00. The heat recovery base itself is about $ 450.00.

For Information:
Heat Exchangers NF Inc.
26 Georgia Dr.
Stephenville, NF A2N 2T5
Tel (709) 643-6046

Preventing Basement Condensation

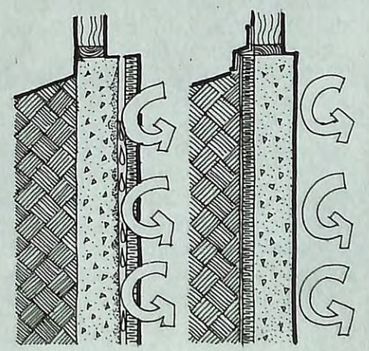
Basements have increasingly become part of the living space in Canadian houses. However, they are plagued with moisture problems that are responsible for musty basement air; mildew on stored items; humidity problems; and structural, wall, floor and furniture decay.

Condensation and pooling of water is especially a problem during the first spring and summer of freshly poured basement walls when insulated on the inside.

There are many possible causes of basement moisture problems. Cold weather building followed by summer weather conditions; full height insulation placed on the basement wall interior; higher moisture content in the basement air than outdoors and concrete surface temperatures at the dew point; poor air barrier detailing that allows moist basement air to circulate in the insulated cavity; fresh concrete has little or no capacity to absorb or store seasonal excess moisture present in the air

Concrete wall surface temperatures in the first summer have been measured to be about the same as those in older basements, so this is not a factor.

Preventive measures to defeat the mechanism at the construction stage should be considered especially in those situations that are at a high risk of first-summer condensation. High risk basements include those built during spring or early summer with a quick interior wall finishing using permeable insulation without building paper separating the insulation and the concrete from grade down. In high water table areas these conditions keep the foundation surfaces exceptionally cool.



Another risk situation is a site where a significant portion of the basement wall is exposed to warm summer air or direct sunlight, causing the concrete to be warmer than the basement air; for example walls with full south exposure and with final landscaping delayed, leaving more of the wall exposed over the first summer period. The moisture is driven inward and downward.

Remedial measures that have been recommended for new houses is to temporarily remove polyethylene and insulation, exposing the concrete wall and ventilating or opening windows to provide good drying conditions.

The best construction practice to avoid moisture problems is to insulate on the exterior of the concrete. If interior insulation must be used, it may be best to leave the wall unfinished for up to a year before insulating, making an effort to lower interior humidity levels; and properly seal the air barrier to prevent convective flows from transporting moist air into the cavity.

Moisture problems will persist longer in the corners, which tend to be the coldest section of the foundation.

The lack of any vapour retarding membrane between the insulation and the concrete in every reported case of basement condensation suggests that excess moisture at the surface of the concrete would be free to circulate through the fibrous insulation and accumulate and condense on an impermeable surface if temperature gradients are present to induce that vapour flow.

Installing a building paper membrane between the insulation and concrete from the grade down (as in required when wood framing is applied to the concrete) may be better than the extra attention of air barrier detailing to prevent convective air flows through the cavity. An airtight

cavity is still recommended, especially to resist winter condensation, but this measure will not have an impact on the temperature-induced vapour diffusion.

Some suggestions have been made that full height insulation is the reason for the increase in moisture problems, but this is not a good explanation as the same condensation problem is happening with part-height insulation. What is the more likely is that it is easier to build with the studs set out from the concrete wall with full height insulation than it is with part height insulation, so it is easier to omit the building paper with full height installations. The shift to thicker, full height insulation has likely resulted in a shift away from using the building paper and this is the more likely cause of greater moisture condensation problems in the last ten years.

So what are the solutions to condensation problems?

Eliminate the sources of moisture before closing in, by allowing the concrete to dry as long as possible.

Use exterior insulation.

This reduces the temperature gradients in the concrete, heating the concrete from the inside, thus setting up outward temperature gradients and moisture flow; it generally results in warmer concrete surfaces, keeping these above dew point temperatures of the room air; and it allows any moisture that does flow inward to do so freely without being trapped on impermeable surfaces.

Control the basement temperature so that if the wet concrete wall heats up, it heats up from the inside, not from the outside. Don't allow the basement to get cold during warm spells in the first summer.

Another alternative that is used by some Quebec builders is to install an inside layer of extruded polystyrene (which is relatively impermeable) down to the footing, before the slab is poured, thus providing a drain path for any moisture that might condense at the interface (this also isolates the cold concrete wall surfaces from potentially moist interior air)

The Great Canadian Reno-Demo Project

We've been reporting on the progress of your editor's house renovation. The work consists of the development of existing basement area by lowering the floor to a full height, plus a 400 sq.ft. addition.

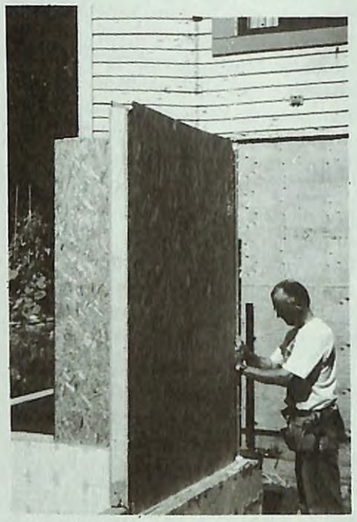
Foundation

The addition is a one storey section, the floor is a slab on grade. The foundation system I opted for is the Lite-Form system, as it is the closest to conventional forming, yet provides good insulation value. Unlike conventional forming, you don't strip it - the foam stays in place, giving you full depth foundation insulation (R16). The 2 inch thick, 8 inch wide polystyrene insulation planks are the formwork. The insulation is pre-slotted at 8 inch centres for nylon ties, which keep the foam planks in place. The reinforcing placement can be easily handled on the nylon ties, which even have tabs to keep the bar in place. The face of the nylon ties acts as a nailing flange for interior or exterior finishes, so that drywall or whatever is screwed directly into the flange.

Various wall thicknesses are available. In our case, we had short walls, so only a 6 inch wall was used. It's an easy system to get familiar with. As Jeff Bain the carpenter said, it's just a full size LEGO set for grown-ups!

The flexibility of the system allows makes it easy to use on irregular surfaces such as rock, because you only use a knife to trim the boards to the contour.

On a flatter site, use of a conventional footing is advisable, and will speed construction and the levelling of the formwork. In our case, because we found a very stiff clay subsoil close to the surface, we opted not to use a footing but to place the foundation walls directly on the ground. This ended up taking extra time to set up and anchor the formwork as it had to be levelled and pinned to an uneven ground surface.



Exterior walls

The addition has been framed with no studs. The next door neighbour was watching the walls going up, but couldn't figure out where the studs were, as the exterior walls are 4' x 8', 4 1/2" thick stressed skin panels. The panels are a sandwich of oriented strand board (OSB) skins between a layer of polystyrene foam insulation. This is a very efficient use of materials as there is a smaller quantity of lower grade wood fibre used in the OSB than would be the case with conventional wood framing and plywood sheathing.

The structural strength is provided by the composite action of the foam and sheathing panels. A tongue and groove joint between panels can easily be modi-

Continued on page 14

R-2000 and New Energy Codes: Is there a Difference?

The R-2000 Program was born as an energy conservation project. The fundamental concern has always been the reduction of purchased energy, to use about 50% of the energy of a comparable conventional house. Energy use is the one item in the house that can be easily metered and measured. However, it was very quickly recognized by home owners that R-2000 houses that meet the energy criteria are not only very energy efficient, but also very comfortable, draft free, and quiet. These subjective features are not as easy to meter and monitor, but a great feature for home owners.

At the outset the energy consumption targets may have been established somewhat arbitrarily, but in the late 1970's (when the program was started) R12 walls and R20 ceilings were considered to be standards for a well insulated house; double glazing (especially sealed units) were uncommon; basements were rarely insulated; and except for the coldest regions, draft proofing of houses was unheard of.

Today, standard practice is much better than that. In addition, whether we like it or not, new energy codes are being introduced to ensure that the standard spec house uses less energy. Some builders are beginning to question if we need to carry on with the R-2000 Program, especially as code requirements seem to have caught up with R-2000.

Energy standards that have been introduced recently vary from province to province and the new National Energy Code for Houses (NECH) is still in draft form. Has the NECH caught up with R-2000 Program requirements? Is the R-2000 program becoming obsolete, as the market has shifted and standard construction is better insulated than in the past? Is there still a market edge to the R-2000 house?

While the NECH will require higher insulation levels for some components, there is still a substantial gap.

The basis of the proposed NECH standards are that they have to be cost effective in each region. That is why you will see requirements based on location and fuel type. The regional requirements were established by doing a life cycle costing analysis that took into consideration not only energy costs but also incremental construction costs. All these are for the basic building envelope compenents only (walls, ceilings, windows, basement walls).

Depending on the part of the country you are building in, and kind of heating fuel used, a NECH "code" house may reduce the space heating consumption by up to 30% compared to current standard practice. The smallest variation is for gas heated houses in Western Canada (where gas prices are very low) and the largest are electrically heated houses in Central and Eastern Canada.

How does this compare to R-2000?

If we are to compare a similar house built as an R-2000 house it is still more energy efficient than an NECH house by 25 to 50%, depending on region. The narrowest gap is for electrically heated houses in Ontario. However, there is another significant factor that has to be taken into account when we compare R-2000 houses to standard code or NECH houses; it can be summarized in two words: quality assurance.

The R-2000 program maintains a quality assurance standard that, among other things, ensures that houses are virtually draft free. The code may require air sealing, but given the detailing specified in the code, there is no assurance that a house built to code will be draft free. Recent tests of market houses show that they are still 2 to 4 times as leaky as the R-2000 standard. In addition, the R-2000 program ensures that there is an effective and functioning ventilation system, and mechanical equipment will be at the higher range of energy efficiency.

With the latest changes in the R-2000 program, the energy performance also takes into account the real energy performance of the building components, as compared to code acceptance of nominal R values. As we know, the thermal bridging through framing can seriously reduce the total R value of a component.

One element we haven't touched on, because codes don't totally address these issues, relates to new concerns for indoor

Energy Consumption Comparisons

Two storey 2800 sq.ft. house

Heating degree days (C)	Vancouver *3007*		Edmonton *5589*		Toronto *4082*		Montreal *4471*		Halifax *4123*	
	Electric	Nat. Gas	Electric	Nat. Gas	Electric	Nat. Gas	Electric	Nat. Gas	Electric	Oil
Conventional House	19,961	30,386	39,197	57,981	26,706	40,723	33,185	50,094	31,040	48,927
1995 NECH standard	17,304	33,939	31,591	60,701	20,759	44,519	25,927	42,052	23,951	35,360
New R-2000 Target	13,219	17,701	21,692	28,966	15,909	22,214	18,186	24,369	17,047	22,664

For comparison, all energy consumption numbers are converted into kwh/year, for the same house.

air quality and environmentally sensitive construction practices, which led to new changes introduced to R-2000 this year.

In some respects the gap between "code" and R-2000 houses may have narrowed somewhat, especially in some colder regions that historically have built very well insulated houses. But in spite of these recent changes there are still significant elements that differentiate the R-2000 house. There is still no area in Canada where a "code" house comes close to meeting the R-2000 standards, which maintains its position at the leading edge, providing what is probably the most energy efficient, environmentally responsible, healthy home available on today's marketplace.

Builders can rest assured that R-2000 is still the leader.

Where there's fire, there's *not* always smoke!

The large forest fire that did so much damage on the outskirts of Penticton B.C. this summer points out another positive feature of air tight construction.

A large custom R-2000 home built by JaeRon Construction Ltd., located on a one acre lot in the forest on the east side of Penticton was evacuated for 8 days. During that period the area surrounding the home was often engulfed in heavy smoke. Unlike most homes in Penticton, the pungent smell of the smoke did not affect the clean environment inside the home. On returning home, the owners could detect no fire smell or ash dust, only the smell of a clean and fresh new house (they had shut off the HRV when being evacuated). In contrast, many houses in the immediate area and throughout Penticton received heavy smoke damage and the home owners are contacting their insurance companies.

This R-2000 home is heated and cooled by a ground source heat pump that also provides domestic hot water. The ventilation system has a three stage air filtering system: a fibreglass prefilter, a high efficiency particulate bag filter, and a zeolite odour filter coupled with the heat recovery ventilator to provide a quality, clean and odourless atmosphere inside the home.

The extra filtration was installed because the house is located near the Penticton landfill and occasionally, when atmospheric conditions are right, the aromas waft past the house.

The Great Canadian Reno Demo (cont from p12)

fied on site to accommodate window and door openings.

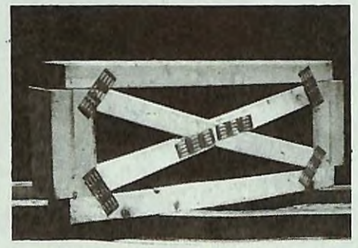
The panels can be easily handled by two persons, so they are erected quickly, providing not only structure, but also the insulated envelope. The best part is that the 4 1/2" wall has much higher insulating values than the R-12 of the conventional 2x4 wall. The manufacturer claims a value of R-28, but I prefer to think of it as R-24.

Roof structure

The roof of the addition also forms a deck for the main floor. In keeping with the desire to be resource efficient, the joists are engineered wood I members manufactured by Jager Industries. Use of engineered wood joists also makes it easier to provide obtain the structural strength and spans with smaller members.

The roof deck is sheathed with a T&G oriented strand board by Louisiana Pacific. The Inner-Seal T&G flooring has been modified from conventional OSB products to address the water problems that affect OSB: swollen edges when water gets at the fibres. The solution is rather ingenious; recognizing that no matter what, you'll get rain at some point during construction, so rather than allowing water to stand, it should be drained right away. The Inner-Seal T&G flooring panels have notches cut into the tongue and panel ends. The reasoning is will act as drains. In addition, the edges are sealed with a water seal.

While I am a great proponent of the use of engineered wood products, none of the manufacturers has dealt with the serious issue of air sealing the joists. It's rather difficult to fit a piece of plywood or foam block in between the flanges of an I section. Fortunately, a local company has developed the WIOS bracing: a pre-fab 2x2 cross bridging unit that is ideal for use with wood I joists. The blocks include crush blocks, so they eliminate the need to fiddle around on site going around strengthening the webs. The distributor



had no problem coming up with a modified version that has a plywood panel on the end, so the only thing left to do is to caulk around the cross bridging, and you have an airtight seal, ideal for cantilevers and upper floor offsets .

Lite-Form Foundations: distributed by Kwikpour Foundations, Stressed skin panels: ISO Building Systems Inc.
WIOS Bracing: Western Interlock Systems Ltd.
We are preparing a project information sheet. For details and contact information, contact Solplan Review

Environmentally Friendly Products

There is a greater interest in using products that have recycled content, and are non toxic.

The R-2000 Program now requires a greater use of recycled content materials and materials with reduced emissions levels. Builders often have trouble accessing the new products. Changes in manufacturing are happening on a daily basis, and distribution lines are not established quickly. Building materials suppliers may not always be tuned in to sources. This list of manufacturers and distributors that handle new product lines that meet the new R-2000 requirements is not comprehensive and will be updated periodically as new information is received. Remember that only some product lines form thes sources will contain recycled content or reduced emissions.

Carpets

Carpeting that contains no glues, has no underpads, (or one that is low in toxicity) are manufactured or distributed by the following:

Crossley Carpet Mills
Truro, NS
Tel: (902) 895-5491
1-800-667-8181
Fax: (902) 893-1625
Toronto, ON
Tel: (416) 677-8701
Fax: (416) 677-5206
Richmond, B.C.
Tel: (604) 273-9171
Fax: (604) 273-0935
Gaskell Carpets Ltd
Ville St. Laurent, PQ
Tel: (514) 341-6181
Fax: (514) 464-6039
Perfection Rug Co. Ltd.
Westmount, PQ
Tel: (514) 939-2400
Fax: (514) 939-1544
Toronto, ON
Tel: (416) 920-5900
Fax: (416) 924-4170
Colin Campbell & Sons
(also Gaskell Carpets Ltd: (UK))
Toronto, ON
Tel: (416) 857-4598
Fax: (416) 857-6593
Calgary, AB
Tel: (403) 245-9222
Fax: (403) 245-4408
Vancouver, B.C.
Tel: (604) 734-2758
Fax: (604) 734-1512
Creation Baumann
Toronto, ON
Tel: (416) 869-1221
Fax: (416) 869-0428
Vancouver, B.C.
Tel: (604) 873-0514
Fax: (604) 873-0194
Floortech Systems
Markham, ON
Tel: (416) 475-6578
Fax: (416) 475-7569
Floorworks
Toronto, ON
Tel: (416) 961-6891
Fax: (416) 961-6891
Winnipeg, MB
Tel: (204) 944-9688
Fax: (204) 942-1663
Godfrey Hirst Australia
Inported by Floorworks
Carlsbad Springs, ON
Tel: (613) 786-1215
Fax: (613) 822-1645
Ruckstuhl (Switzerland)
Imported by Baumann Fabrics
Toronto, ON
Tel: (416) 869-1221
Fax: (416) 869-0428
Triathlon Carpets
Etobicoke, ON
Tel: (416) 564-2343
Fax: (416) 564-2106
Erv Parent Co. Ltd.
Regina, SK
Tel: (306) 721-2383
Fax: (306) 721-2454
Calgary, AB
Tel: (403) 253-3145
Fax: (403) 255-1127
New Westminster, B.C.
Tel: (604) 525-4142
Fax: (604) 525-3777
Andy Miller and Associates
Calgary, AB
Tel: (403) 254-0309
Cavalier Bremworth Ltd
(New Zealand)
Concord, CA
Tel: (510) 798-7242
Collins & Aikman
Floor Coverings Division
Dalton, GA
Tel: 1-800-241-4085
Image Carpet
Armuchee, GA
Tel: 1-800-722-2504
Fax: (404) 234-3464
Jack Lenor Larsen
New York, NY
Tel: (416) 869-1221
Fax: (416) 869-0428
Merida Meridian Inc.
Syracuse, NY
Tel: (315) 422-4921
Tintawn Carpets (Ireland)
New York, NY
Tel: (212) 355-5030
Fax: (212) 644-8359
Van Besouw BV/KVT
International Ltd (Holland)
Atlanta, GA
Tel: (404) 525-6643

Air Filtration

Air filters with a minimum 10% ASHRAE average dust spot efficiency are available from the following distributors. These filters are to be installed where air circulating, heating, cooling and ventilation systems are used.

Environment Air Ltd
Cocagne, NB
Tel: (506) 576-6672
Fax: (506) 576-9838
Venmar Ventilation Inc.
Drummondville, PQ
Tel: (819) 477-6226
Fax: (819) 474-3066
Farr Inc.
Laval, PQ
Tel: (514) 384-6401
Fax: (514) 662-6035
Mississauga, ON
Tel: (905) 890-1040
Fax: (905) 890-5818
Winnipeg, MB
Tel: (204) 233-4632
Fax: (204) 233-0004
Burnaby, B.C.
Tel: (604) 299-8804
Fax: (604) 299-4372
Broan Manufacturing
Mississauga, ON
Tel: (905) 670-2500
Carter Day Industries (Canada) Ltd
Newmarket, ON
Tel: (905) 853-7020
Fax: (905) 852-1975
Century Environmental Systems
Burlington, ON
Tel: (416) 336-3702
Fax: (416) 332-5956
Electro-Air Canada Ltd
Concord, ON
Tel: (905) 669-5620 or
1-800-267-8305
Fax: (905) 669-5356
Emtrol Ltd
Scarborough, ON
Tel: (416) 298-0988
Nutech Energy Systems Inc.
London, ON
Tel: (519) 457-1904
Fax: (519) 457-1676
Source-Vac Inc
Brampton, ON
Tel: (416) 840-4300
Tel: (416) 840-4855
Carter Day Industries
Winnipeg, MB
Tel: (204) 786-5781
Fax: (204) 783-9704
Calgary, AB
Tel: (403) 253-6309
Fax: (403) 259-5291
Conservation Energy Systems Inc
Saskatoon, SK
Tel: (306) 242-3663
Fax: (306) 243-3484
Allied Blower & Sheet Metal Ltd
Surrey, B.C.
Tel: (604) 524-8691
Fax: (604) 581-4159
BC Air Filter Ltd
Burnaby, B.C.
Tel: (604) 291-2544
Fax: (604) 291-2510
Honeywell Inc
Golden Valley, MN
Tel: (612) 542-3356
RAYDOT Incorporation
Cokato, MN
Tel: (612) 286-2103

Floor Adhesives

Finish flooring adhesives that are either water dispersion or pre-adhesive types, or have zero volatile content are manufactured or distributed by the following:

Roberts Company
Bramalea, ON
Tel: (416) 791-4444
Fax; (416) 791-1998
AFM Enterprises Inc
Thunder Bay, ON
Tel: (807) 345-2300
Vancouver, B.C.
Tel: (604) 392-7119 or
1-800-661-2620
Fax: (604) 861-8381
Riverside, CA
Tel: (714) 781-6860
Fax: (714) 781-6892
Naturhaus (Germany)
Lindquist Marketing
Mission, B.C.
Tel: (604) 826-1547
Auro Organic Paints (Germany)
Sinan Co. Natural
Building Materials
Davis, CA
Tel: (916) 753-3104
W F Taylor Co Inc
Santa Fe Springs, CA
Tel: 1-800-397-4583 or
(310) 802-1896
Fax: (310) 802-2831
Livos Plant Chemistry (USA)
Sante Fe, MN
Tel: (505) 438-3448

Kitchen Cabinets and Bathroom Vanities

Kitchen cabinets and bathroom vanities made from manufactured wood products that are formaldehyde-free, or particle board that meets the HUD standard, or have all exposed surfaces sealed with an Environmental Choice water based sealer or a zero volatile content sealer. Sources of panel board materials that would meet these requirements are manufactured by the following:

Flakeboard Company Ltd
St. Stephen, NB
Tel: (506) 466-2370
Fax: (506) 466-7113
Markham, ON
Tel: (905) 475-9830
Fax: (905) 475-3988
Forpan Inc
Val D'Or, PQ
Tel: (819) 825-6550
Fax: (819) 825-0785
Levésque Plywood Limited
Mascouche Heights, PQ
Tel: (514) 477-1964
Fax: (514) 477-5364
Pan Fibre Inc
Mont-Laurier, PQ
Tel: (819) 623-7133
Fax: (819) 623-7103
Panneaux Décoratifs Domtar
Montreal, PQ
Tel: (514) 848-6956
fax: (514) 848- 5124
Panval Inc
Sayabec, PQ
Tel: (418) 536-5465
Fax: (418) 536-3636
Société en Commandite Tafisa Canada
Lac-Meganite, PQ
Tel: (819) 583-2930
Fax: (819) 583-2931
Uniboard Inc.
Sainte-Foy, PQ
Tel: (418) 659-5240
Fax: (418) 659-4568
Unipres Inc.
Val d'Or, PQ
Tel: (819) 825-6550

Fax: (819) 825-9372
Canac Kitchens Ltd.
Thornhill, ON
Tel: (905) 881-2153
Fax: (905) 881-9725
Domtar Decorative Panels
Huntsville, ON
Tel: (705) 789-9683
Fax: (705) 789-6655
Levesque Plywood Limited
Hearst, ON
Tel: (705) 362-4242
Fax: (705) 372-1549
Proboard Ltd
Atikeka, ON
Tel: (807) 597-6921
Fax: (807 597-5264
Rexwood Products Ltd
New Liskeard, ON
Tel: (705) 647-6775
Fax: (705) 647-6700
Blue Ridge Lumber Ltd
Whitecourt, AB
Tel: (403) 648-6200
Fax: (403) 648-6396
Enviro-Safe 2000
Burnaby, B.C.
Tel: (604) 298-1050
Fax: (604) 298-1057
CANPAR Industries
Vancouver, B.C.
Tel: (604) 681-7336
Fax: (604) 681-8906

MacMillan Bloedel Limited
Vancouver, B.C.
Tel: (604) 661-8000
Fax: (604) 661-8377
Northwest Panelboard
Smithers, B.C.
Tel: (604) 847-4394
Fax: (604) 847-9687
Rodman Industries
Marinetter, WI
Tel: (715) 735-9541
Medite Corporation
Medford, OR
Tel: (503) 779-9596
Fax: (503) 779-9921

Sealers for Particleboard

Water based, or zero volatile content sealers that are suitable for use on kitchen cabinets and bathroom vanities are manufactured by the following:
Livos Plant Chemistry
Imported by Eco-House (1988) Inc
Fredericton, NB
Tel: (506) 366-3529
Tel: (506) 366-3577
Sante Fe, NM
Tel: (505) 438-3448

Fletco Company Inc.
Richmond, B.C.
Tel: (604) 273-8031
Fax: (604) 273-6026
Oakland, CA
Tel: (510) 655-2470
Fax: (510) 652-0969
Naturhaus (Germany)
Lindquist Marketing
Mission, B.C.
Tel: (604) 826-1547
Biofa Naturfarben GmbH
(Germany); Bau, Inc
Alton, NH
Tel: (603) 364-2400

Materials Conservation

Insulation containing recycled content is maufactured by the following:

Cellulose insulation (100% recycled material):
Prosumex Inc
Pointe-Claire, PQ
Tel: (514) 694-1485 or 1-800-363-7876
Fax: (514) 694-3999
Climatizer Insulation Inc
Etobicoke, ON
Tel: (416) 798-1235
Fax: (416) 789-1311

Thermo-Cell Insulation
Orleans, ON
Tel: (613) 837-9797
Can-Cell Insulation Inc
Edmonton, AB
Tel: (403) 447-1255
Fax: (403) 447-1034
Able Mechanical
Insulation Ltd
Surrey, B.C.
Tel: (604) 597-0100
International Cellulose Corp
Houston, Texas
Tel: 1-800-444-1252
Fax: (713) 433-2029
Louisiana-Pacific
Portland, OR
Tel: (503) 221-0800
Fax: (503) 796-0204
American Sprayed Fibers
Merrillville, IN
Tel: 1-800-824-2997
I.F. Industries
Oakville, ON
Tel: (416) 827-6358
Fax: (416) 827-9342

Mineral wool (minimum of 50% recycled content)
Roxul
Milton, ON
Tel: (905) 878-8474
Tel: 1-800-265-6678

Partek Insulations Inc
Peachtree City, GA
Tel: (404) 631-1200
Rock Wool
Manufacturing Co
Leeds, AL
Tel: (205) 699-6121
Isolatek International
Stanhope, NJ
Tel: (201) 347-1200

Fibre glass insulation (minimum of 50% recycled content):
Ottawa Fibre Inc
Ottawa, ON
Tel: (613) 736-1215
Fax (613) 736-1150

Materials Conservation

Roofing systems that contain recycled materials, (metal, paper, wood fibres, plastic, or rubber) are available from the following:

Les Tuiles de Genéve
Magog, PQ
Tel: (514) 449-2966
Fax: (514) 449-2966
Classic Products
Granby, PQ
Tel: (514) 375-4698

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Tel: (509) 756-0861
Gregg Steel Shakes
Orillia, ON
Tel: (705) 325-3405
Fax: (705) 325-3020
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Hamilton, ON
Tel: (416) 529-6818
Mair Roofing
Manufacturing Ltd
Brantford, ON
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Fax: (519) 752-1139
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Brampton, ON
Tel: (416) 277-5151
Winnipeg, MB
Tel: (204) 786-6426
Certain Teed Corporation
Thunder Bay, ON
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Nailite International
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Tel: (519) 442-6375
Elad Building Products
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Tel: (905) 652-2240
Classic Products Inc
Barbisan Roofing & Siding
Sault Ste. Marie, ON
Tel: (705) 253-1664
Metal Contracting Unlimited
Brampton, ON
Tel: (905) 794-2300
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Abbotsford, B.C.
Tel: (604) 855-4222
Classic Products
Best Way Roofers Supply
Kelowna, B.C.
Tel: (604) 763-4405
Classic Products
Piqua, Ohio
Tel: (513) 773-9840

Drywall

Products containing recycled gypsum and newsprint
Canadian Gypsum Co
Toronto, ON
Tel: (416) 595-8800
Fax: (416) 595-8888
Domtar Gypsum
Caledonia, ON
Tel: (416) 765-0580
Winnipeg, MB
Tel: (204) 784-2420
Edmonton, AB
Tel: (403) 472-6732
Surrey, B.C.
Tel: (604) 580-0620
Louisianna Pacific
Portland, OR
Tel: (503) 221-0800
Fax: (503) 796-0204

Highland American Co
East Providence, RI
Tel: (401) 438-4990
Fax: (401) 438-4993
Furman Lumber Inc
Nutting Lake, MA
Tel: (508) 670-3800
1-800-843-9663
Fax: (508) 670-3999

Siding made from factory or sawmill waste is manufactured by the following:
Louisianna-Pacific
Canada Ltd
Port Hawksbury, NS
Tel: (902) 625-3070
Fax: (902) 625-3347
Canadian Pacific Forest
Products Ltd
Montreal, PQ
Tel: (514) 878-4811
Fax: (514) 878-4850
Grand Prairie, AB
Tel: (403) 538-7711
Fax: (403) 538-7800
Vancouver, B.C.
Tel: (604) 661-5241
Fax: (604) 661-5273
MacMillan Bloedel
Champlain Division
Vancouver, B.C.
Tel: (604) 439-2260
Fax: (604) 439-2277

Fibreboard containing recycled paper or wood fibres is manufactured by the following:

Homasote Company
West Trenton, NJ
Tel: (609) 883-3300
Fax: (609) 530-1584
Louisiana-Pacific
Available through local distributors primarily in Eastern Canada.
Poly Plast
Brampton, ON
Tel: (905) 840-2472
Canadian Pacific Forest
Products Ltd
Montreal, PQ
Tel: (514) 878-4811
Fax: (514) 878-4850
Tofco Marketing Ltd
Ontario Regional Office
Woodbridge, ON
Tel: (416) 856-4994
Fax: (416) 856-4994
Can Fibre
Burnaby, B.C.
Tel: (604) 432-1400

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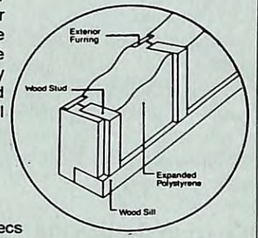

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CCMC evaluation Report No. 09589

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Fax: (709) 579-4660
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Truefoam Limited
11 Mosher Dr.
Dartmouth, N.S.
B3B 1L8
Tel: (902) 468-5440
Fax: (902) 468-4691
Quebec
Fransyl Ltee.
671 rue Leville
Terrebonne, Que.
G1K 6X9
Tel: (800) 363-2307
Fax: (514) 492-5415
Ontario
Ottawa Newhouse Building Systems
49 Stevenson Cr.
Renfrew, ON
K7V 1J4
Tel: 1-800 257-4424
Kingston
Robert Preston Enterprises
R.R. #1
Enterprise, ON
K0K 1Z0
Tel: (613) 379-5532
Fax: (613) 379-5557
Hunstsville
Building Innovations
c/o George Bell
Box 970
Hunstsville, ON
P0A 1K0
Tel: (705) 789-7851
Sudbury
Insul-North Building Systems Ltd.
268 Cedar St.
Sudbury, ON
P3B 1M7
Tel: (705) 671-2697
Fax: (705) 675-6460
Manitoba & Eastern Saskatchewan
Aerofoam Div. Border Chemical Co. Ltd.
2485 Day St.
Winnipeg, MB
R2C 2X5
Tel: (204) 222-3261
Fax: (204) 222-8817
Alberta, BC, NWT, YT & Western Saskatchewan
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Fax (403) 453-3955

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Fax: (905 250-9269
Canadian Forest
Products Ltd.
Grand Prairie, AB
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Fax: (403) 538-7800

Paints

Waterbased for interior use that meet or exceed the Environment Canada. Environmental Choice Standards (Ecologo) are now available from all manufactures. A number now also have No or Low VOC paints. Because of the wide availability of these products, there is no need to list sources.

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Healthy Materials

A new twice a year publication by CMHC on Material Emission testing and Standards Activities to help those who are developing material emission testing protocols, standards and codes become aware of what other parties are doing, worldwide. The intent is to distribute Healthy Materials free-of-charge to a broad international audience of researchers, regulators, manufacturers, specialist builders and designers, and government agencies.

This publication can help avoid duplication of effort, improve the quality of protocols and standard, and also reduce unnecessary conflicts between codes. Secondary benefits will be the production of lower-emission products and a more informed and discriminating marketplace. It will not include opinions or technical articles, but will include news of protocols, standards and codes in place and under development

Forintek Evaluates VOCs from Composite Panels

To deal with the lack of data on volatile organic compounds (VOC) emissions, Canada's Structural Board Association (SBA) is undertaking a two-year testing project. While emissions data are available from American and European sources, the nature and quantity of VOC's associated with composite wood panels vary greatly from mill to mill, depending upon the product, the species of wood and the manufacturing process.

Emissions testing is now being conducted on a series of composite panel products, including particleboard, medium density fibreboard (MDF), oriented strandboard (OSB) and plywood.

The results will provide manufacturers with a Canadian VOC database, recommended VOC reduction strategies, a knowledge of international VOC regulations and a reliable third party test facility for future testing.

Emissions and the Ecologo Label

New R-2000 Program standards rely heavily upon the "Ecologo" as a means for identifying low-emission products. Does this label provide the builder, designer or occupant with an assurance of non-toxic or low-emission performance?

"Ecologo" is the label of the Environmental Choice Program. The Program evaluates products on the basis of their total impact on the environment, so a great many factors need to be analyzed, including energy consumption, outdoor emissions, resource depletion, recycled content and packaging. Guidelines are updated periodically.

VOC emissions can be an important environmental factor due to their role in both indoor and atmospheric pollution. Ecologo standards specify limits on the total material content that contributes to emissions, rather than an emission rate. This simplifies the testing process, as emission rates will depend on the type of coatings, the number of coats, environmental conditions and air exchange rates.

ENVIRONMENTAL CHOICES

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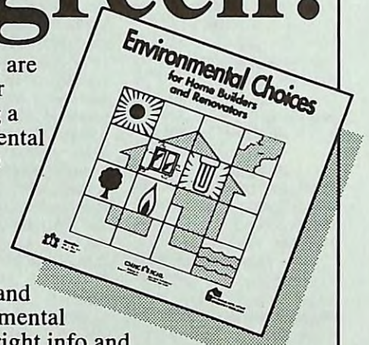

Whether you are building or renovating a home, "Environmental Choices for Home Builders and Renovators" can guide you on the path to success.

Making effective and profitable environmental choices takes the right info and careful planning. There are many ways you can improve the homes you build or renovate to meet your customers' environmental expectations in the 90s. That's what this manual is all about!

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Environmental Choices Manual Sales, Canadian Home Builders' Association, 150 Laurier Avenue West, Suite 200, Ottawa, Ontario, Canada, K1P 5J4

TVOC content (calculated from confidential product formulations submitted by the manufacturer) is expressed in grams of VOCs per litre of product.

What are the present Ecologo standards?

Water-Based Paints

The original VOC guideline of 250 g/L was adopted in 1989. Most water-based paints are now in the range of 100 - 150 g/L, and 250 g/L represents the high-gloss enamel paints.

Solvent-Based Paints

VOC guideline of 380 g/L was selected, which is lower than the industry average of 400 - 450 g/L Only a small number of products have received the Ecologo label to date.

Wood Finishes and Stains

The draft 1994 version stipulates maximum VOC contents of 300 g/L for varnishes and 250 g/L for stains. Solvent-based varnishes and stains are not eligible for an Ecologo label.

Adhesives

The VOC guideline for adhesive products, introduced in 1992, is 20 g/L. In addition to the substances banned for water-borne paints, borax is not allowed in the formation or manufacture.

Sealants and Caulking Compounds

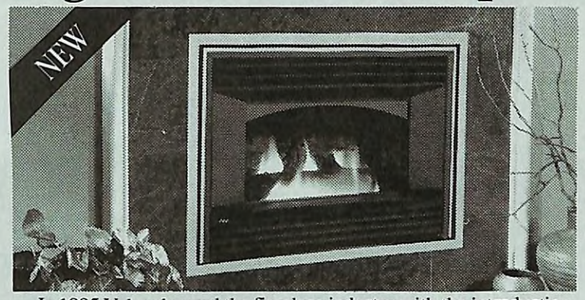
A limit of 20 g/L has been set for caulks and sealants.

Carpet Labelling

A carpet labelling program has been undertaken by the Carpet and Rug Institute (CRI). The Canadian Carpet Institute (CCI - representing 85% of all carpets produced in Canada) is now a partner with CRI in the labelling effort. Under the CRI/CCI program, carpets from all member-manufacturers are tested annually. Those that pass the test will bear the CRI/CCI label.

The characteristic "new-carpet odour" comes from 4-phenylcyclohexene (4-PC), emitted largely from the styrene butadiene rubber (SBR) latex used for backing in almost 95% of carpets. 4-PC emissions drop significantly within a week of installation but can linger over time.

Introducing the New Legend Direct Vent Fireplace



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Ventilate for	Body Pollutants	Activity Pollutants
Odour	Body odour: 1 olf/day	Toilet: 3 olfs/use Cooking: 7 olfs/use
Moisture	Breath & pores: 1 qt//day/person	Shower, cooking, laundry: 1 qt/day/person
Carbon Dioxide	Breath: 20 cubic ft/day/person	n/a
Ventilation Rate required	15cfm continuous per person	Intermittent fan rate— Bath: 50 cfm Kitchen: 100 cfm
Total Daily	20,000 cubic ft/day	2,000 cubic ft/day

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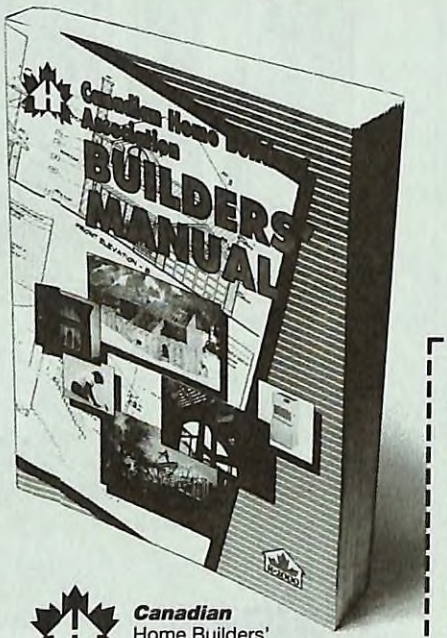

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